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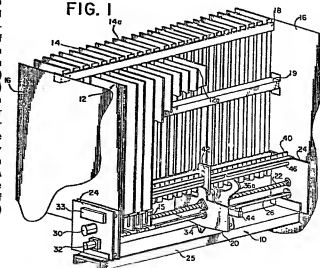
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(84) Package dispenser mechanism.

(97) A computer-controlled system is disclosed for dispensing selected packages from a vending machine. The system includes an ejector mechanism (10) adapted to travel rectilinearly intermediate a pair of oppositely-mounted storage banks (12, 14), each bank consisting of a plurality of vertically-oriented adjacent compartments (12a, 14a) in which distinct packages are stacked. The ejector mechanism (10) includes a carriage (20) mounted on a helical screw (22) rotatably driven by a travel motor (30). An ejector lever (34) pivotally connected to the carriage (20) is mounted upon an actuator bar (26) rotatably driven by a pivot member (32) for independently actuating one of a pair of overlapping ejector arms (36a, 36b) according to the directional rotation of the pivot motor (32). Each ejection arm (36a, 36b) is pivotally connected to the carriage (20) and configured to discharge a single package from beneath a stack when actuated. A microprocessor (33) controls the rotational drive of the motors and is provided feedback signals indicative of carriage location and package availability by sensors (42, 45) attached to the carriage (20).

**FIG. 1**



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## PACKAGE DISPENSER MECHANISM

### BACKGROUND OF THE INVENTION

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The present invention relates to package dispensing, and more particularly to an improved dispensing system for a vending machine wherein a dual-acting ejector mechanism is adapted to travel within oppositely mounted storage banks to increase selection capacity.

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Coin-operated vending machines utilize a variety of different systems for dispensing the articles stored and selected. Such dispensing systems are basically mechanical and electrical in operation, and generally require

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duplicate actuating parts for each of the various selection stations at which different articles are stored. As these vending machines offer an increasingly larger selection of items, the number of machine parts become large and the resulting costs of such machines becomes prohibitive.

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While current vending machines have progressed technically with respect to the mechanisms provided therein for dispensing the articles selected, none of such vending machines have been satisfactory in providing an increased selection capability without higher machine costs. Furthermore, currently available dispenser mechanisms are complicated in structure and operation, being composed of a multitude of moving parts that increase maintenance problems and the risks of malfunction.

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### SUMMARY OF THE INVENTION

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Accordingly, it is a general purpose and object of the present invention to provide an improved dispensing sys-

01 tem for a vending machine whereby a larger selection of  
vendable packages is provided without increased machine  
costs.

05 Another object of the present invention is to provide an  
efficient system for dispensing the articles stored in a  
vending machine that is dynamic and computer-controll to  
selectively discharge the packages using a limited number  
of moving parts.

10 Still another object of the present invention is to pro-  
vide a high-capacity package dispensing system for use in  
vending machines that is reliable in operation and  
economical to manufacture.

15 Briefly, these and other objects of the present invention  
are accomplished by a computer-controlled system for dis-  
pensing selected packages from a vending machine. The  
system includes an ejector mechanism mounted to travel  
20 rectilinearly within a pair of oppositely situated storage  
banks, each bank consisting of a plurality of vertically  
oriented adjacent compartments in which distinct packages  
are stored. The ejector mechanism includes a carriage  
mounted on a helical screw driven by a travel motor. An  
25 ejector lever pivotally connected to the carriage is  
mounted upon an actuator bar driven by a pivot motor for  
rotatably actuating either one of a pair of independent  
ejector arms depending on the direction of rotation of the  
pivot motor. Each ejector arm is pivotally connected to  
30 the carriage and configured to engage the lever so that a  
single package is discharged from a compartment when  
actuated. A microprocessor controls the rotational drive  
of the motors and is provided feedback signals indicative  
of carriage location and package availability thereat by a  
35 travel sensor and pack sensor, respectively.

- 01 For a better understanding of these and other aspects of  
the present invention, reference may be made to the follow-  
ing detailed description taken in conjunction with the  
accompanying drawings in which like reference numerals  
05 designate like parts throughout the figures thereof.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

- Referring now to FIGS. 1 and 2, a package dispensing  
10 system is shown wherein an ejector mechanism 10 is mounted  
for rectilinear travel beneath and between a front and  
back storage bank 12 and 14, respectively. Storage banks  
12 and 14 are oppositely situated between a pair of side  
panels 16 and are supported therebetween by upper and  
15 lower support bars, 18 and 19, respectively. Each storage  
bank 12 and 14 consists of an equal number of adjacent  
compartments 12a and 14a, typically as many as thirty in  
each bank, that are vertically oriented to store stacks of  
packages therein. Compartments 12a and 14a are preferably  
20 adjustable in depth to accommodate packages of various  
lengths, and are configured at the bottoms thereof to hold  
the packages in place until ejection. A spring clip 15  
attached at the bottom of each compartment 12a and 14a  
retains the bottom package prior to its ejection into  
25 collection chutes (not shown) located below each storage  
bank 12 and 14.

- The ejector mechanism 10 includes an ejector carriage 20  
through which a helical screw 22 is rotatably coupled.  
30 Helical screw 22 is an elongated member extending the  
length of storage banks 12 and 14 between and below the  
banks. The helical screw 22 is rotatably connected at its  
ends to side brackets 24 supported on either side of  
storage banks 12 and 14 upon a mounting frame 25 that  
35 spans the length of the banks. A travel motor 30 secured

01 to side bracket 24 is coupled to one end of helical screw  
22 for driving the screw in rotation in a clockwise or  
counterclockwise direction so that the ejector carriage 20  
is moved rectilinearly back and forth as desired. Travel  
05 motor 30a is low voltage electric motor controlled by a  
microprocessor 33 described in greater detail hereinafter,  
and may be gear-coupled to helical screw 22 to provide  
rotational drive thereto.

10 A square actuator bar 26 extending substantially parallel  
to and just below helical screw 22 is likewise rotatably  
coupled to ejector carriage 20. The ends of actuator bar  
26 are journaled and rotatably connected to side brackets  
24. A pivot motor 32, similar to the travel motor 30, is  
15 secured to side bracket 24 and coupled to one end of the  
actuator bar 26 for driving the bar in rotation in either  
a clockwise or counterclockwise direction as controlled by  
microprocessor 33. An angle limiter 28 is coupled to the  
opposite end of actuator bar 26 for sensing the angle of  
20 rotation thereof and for providing a feedback signal to  
the pivot motor 32 for limiting rotation to a pre-  
determined angle, typically  $60^{\circ}$  in either direction. The  
angle limiter 28 may take any suitable form and may, for  
example, be an appropriately slotted cup coupled to the  
25 actuator bar 26 which cooperates with an infra red emitter  
and receiver to form a conventional beam breaking sensor.

Referring now to FIG. 3 in conjunction with FIGS. 1 and 2,  
an ejector lever 34 is pivotally connected to carriage 20  
30 and mounted upon actuator bar 26 so that the lever travels  
rectilinearly along with the carriage and is rotated  
appropriately in either direction by the square bar. A  
pair of ejector arms 36a and 36b are pivotally connected  
to carriage 20 on opposite sides thereof about respective  
35 axes AA and BB, so that the arms normally overlap each

01 other and each arm is similarly configured to interengage  
ejector lever 34 for independent cooperation therewith. A  
pair of actuating pins 35a and 35b are affixed to the  
lower portion of ejector lever 34 on opposite sides there-  
05 of and normally engage actuating slots 37a and 37b, re-  
spectively, formed in ejector arms 36a and 36b. A guide  
pin 38 affixed to the upper portion of ejector lever 34 is  
aligned with radial guide slots 39a and 39b formed in  
ejector arms 36a and 36b, respectively.

10 A sensor bar 40 having a plurality of slots 41 formed  
therein to correspond with distinct ones of the vertical  
compartments 12a and 14a is mounted to span the length of  
storage banks 12 and 14 above and substantially parallel  
15 to the helical screw 22 and actuator bar 26. A travel  
sensor 42 attached to the top of ejector carriage 20  
includes an infrared emitter 43 and receiver 43' which are  
positioned on opposite sides of the slotted sensor bar 40  
to form a conventional beam breaking sensor which provides  
20 a feedback signal to the microprocessor 33 indicative of  
the compartmental location of the carriage. Pack sensors  
44 are mounted on either side of carriage 20 and are  
provided with adjacent upwardly directed infrared light  
emitters and receivers 45 which provide the microprocessor  
25 33 with a feedback signal indicative of the availability  
of packages at a particular compartmental location in  
either the front or back storage bank, 12 and 14, re-  
spectively. One of the pack sensors 44 would project a  
beam of light up the particular vertical compartment 12a  
30 or 14a at which the carriage 20 stopped, and if a pack P  
or P' were available for dispensing, reflective light from  
the pack would be returned to the sensor thereby signaling  
the microprocessor 33 of the advisability of actuation of  
ejector mechanism 10. If the compartment 12a or 14a is  
35 empty, no light is reflected and the package sensor 44

01 would signal microprocessor 33 of the unadvisability of  
actuation of ejector mechanism 10 and an appropriate  
signal could be displayed to the user. An elongated rod 46  
extending the length of the storage banks, 12 and 14,  
05 through which the ejector carriage 20 travels, is mounted  
to engage the upper portion of the carriage so that the  
ejector mechanism 10 is stabilized during the torquing of  
the ejection actuation.

10 Referring now to FIGS. 4 and 5 in conjunction with FIGS. 1  
- 3, the operation of the dispensing system will now be  
described. A coin-activated selector 50 signals micro-  
processor 33 of the selection of a desired package P.  
Microprocessor 33 includes a memory in which is stored the  
15 last compartmental position of ejector mechanism 20 and  
the new compartmental location of the desired package P.  
Microprocessor 33 appropriately energizes travel motor 30  
to drive helical screw in either a clockwise or counter-  
clockwise direction thereby moving the ejector mechanism  
20 10 via carriage 20 to the compartmental location of the  
desired package P. Travel motor 30 ceases to drive helical  
screw 22 and the ejector mechanism 10 stops at the desired  
location upon the feedback signal provided to micro-  
processor 33 from travel sensor 42.

25 Having reached the desired compartmental location, pack  
sensor 44 determines the availability of package P in the  
vertical compartment 14a and signals microprocessor 33  
appropriately. Microprocessor 33 energizes pivot motor 32  
30 to drive actuator bar 26 in a counterclockwise direction  
(as viewed in FIG. 4) sensed and limited by angle sensor  
28. Counterclockwise rotation of actuator bar 26 turns  
ejector lever 34 in the same direction thereby pivoting  
ejector arm 36b in a clockwise direction about axis BB  
35 through the cooperation of actuating pin 35b on the

01 ejector lever and slot 37b in the ejector arm. In the  
course of its pivotal action, ejector arm 36b pushes  
package P out of compartment 14a, through retaining spring  
15, and into a chute (not shown) for collection. Insured  
05 by engagement of guide pin 38 in guide slot 39a, the  
opposite ejector arm 36a is maintained in its normal  
position during pivotal actuation of ejector arm 36b.  
Accordingly, each ejector arm acts independently of the  
other. It should be noted that the upper portion of the  
10 ejector arms 36a, 36b is configured to push out or eject  
only the next available package while retaining the remain-  
ing packages in the stack thereby dispensing one package  
at a time.

15 Therefore, it is apparent that the disclosed invention  
provides an improved article dispensing system for par-  
ticular use in vending machine applications whereby an  
increased selection capability is provided without  
incurring increased machine costs. In addition, the dis-  
20 closed package dispensing system provides an efficient  
means of delivering selected articles that is dynamic and  
computer-controlled to selectively discharge the desired  
articles one at a time using a limited amount of moving  
parts. Furthermore, the present invention provides a high-  
25 capacity dispensing system that is reliable in operation  
and economical to manufacture.

Obviously, other embodiments and modifications of the  
present invention will readily come to those of ordinary  
30 skill in the art having the benefit of the teachings  
presented in the foregoing description and drawings. It is  
therefore to be understood that various changes in the  
details, materials, steps, and arrangements of parts,  
which have been described and illustrated to explain the  
35 nature of the invention, may be made by those skilled in



01    the art within the principle and scope of the invention as  
expressed in the appended claims.

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CLAIMS

- 05 1. A package dispensing apparatus characterized by a frame (25) with a carriage (20) movably mounted there on and a lever (34) rotatably connected on said carriage, where two arms (36a,36b) are pivotally connected to said carriage (20) and engaged by said lever (34) in such manner that one of said arms (36b) independently pivots clockwise upon counterclockwise rotation of said lever (34) and the other of said arms (36a) independently pivots counterclockwise upon clockwise rotation of said lever (34).
- 15 2. An apparatus according to Claim 1 further comprising: means (22,30) for moving said carriage (20) to a selectable position along said frame (25); means (26,32) for selectively rotating said lever (34) in either a clockwise or counterclockwise direction.
- 20 3. An apparatus according to Claim 2 wherein said means (22,30) for moving said carriage (20) comprises: a first motor (30) affixed to said frame (25); an elongated screw (22) driven by said first motor (30) and threadably engaging said carriage (20); and sensor (42) means coupled to said carriage (20) to detect the position of said carriage (20) along said frame (25).
- 25 4. An apparatus according to Claim 3 wherein said means (26,32) for rotating said lever (34) comprises: a second motor (32) affixed to said frame (25); and an elongated bar (26) driven by said second motor (32) and engaging said lever (34) for rotation thereof.
- 30 5. An apparatus according to Claim 4 further comprising: sensor means (28) coupled to said bar (26) for limiting
- 35

01 the rotation of said bar (26) to a predetermined degree  
in either direction of rotation.

05 6. An apparatus comprising: a frame (25); a carriage (20)  
rotatably mounted on said frame (25); a lever (34)  
rotatably connected to said carriage (20); two arms  
(36a,36b) pivotally connected to said carriage (20) and  
engaged by said lever (34) in such manner that one of  
10 said arms (36b) independently pivots clockwise upon  
counterclockwise rotation of said lever (34) and the  
other of said arms (36a) independently pivots counter-  
clockwise upon clockwise rotation of said lever (34);  
means (22,30) for moving said carriage along said frame  
(25); means (26,32) for rotating said lever in either a  
15 clockwise or counterclockwise direction; means (42)  
coupled to said carriage (20) for producing a signal  
indicative of the position of the carriage (20) along  
the frame (25); means (28) coupled to said lever (34)  
for producing a signal indicative of the direction and  
20 degree to which the lever has rotated; and control  
means (33) responsive to both said signals for causing  
said carriage (20) to assume a selectable position  
along said frame (25) and for limiting the rotation of  
said lever (34) to a predetermined degree in either  
25 direction of rotation.

7. An apparatus according to Claim 6 further including:  
means (44) coupled to said carriage (20) and to said  
control means (33) for producing a signal indicative of  
30 the presence or absence of objects (P,P') located in a  
predetermined direction away from said carriage (20).

8. An apparatus according to Claim 6 wherein said means  
(22,30) for moving said carriage (20) includes a first  
35 motor (30) which is affixed to said frame (25) and

01 drives an elongated screw (22) threadably engaging said  
carriage (20), and wherein said means (26,32) for  
rotating said lever (34) includes a second motor (32)  
which is affixed to said frame and drives an elongated  
05 bar (26) engaging said lever (34).

9. An apparatus for dispensing packages comprising: a pair  
(12,14) of opposed storage banks; a plurality of  
package storage compartments (12a,14a) located at pre-  
10 determined positions within each of said banks (12,14);  
a frame (25) mounted between said banks (12,14); a  
carriage (20) movably mounted on said frame (25); a  
lever (34) rotatably connected to said carriage (20);  
two arms (36a,36b), each having a portion adapted to  
15 engage a package (P,P'), pivotally connected to said  
carriage (20) in such manner that one of said arms  
(36b) independently pivots towards one of said banks  
(14) upon counterclockwise rotation of said lever (34)  
and the other of said arms (36a) independently pivots  
20 towards the other of said banks (12) upon clockwise  
rotation of said lever (34); means (22,30) for moving  
said carriage along said frame; means (26,32) for  
rotating said lever (34) in either a clockwise or  
counterclockwise direction; means (42) coupled to said  
25 carriage (20) for producing a signal indicative of the  
position of said carriage (20) with respect to said  
predetermined positions: means (28) coupled to said  
lever (34) for producing a signal indicative of the  
direction and degree to which the lever (34) has  
30 rotated; and control means (33) responsive to both said  
signals for causing said carriage (20) to assume a  
selected one of said plurality of predetermined  
positions and for limiting the rotation of said lever  
(34) to a predetermined degree in either direction of  
35 rotation.

01 10. An apparatus according to Claim 9 further including:  
means (44) coupled to said carriage (20) and to said  
control means (33) for producing a signal indicative  
05 of the presence or absence of an article (P,P') within  
any selected one of said plurality of package storage  
compartments (12a,14a).

11. An apparatus according to Claim 9 wherein said means  
(22,30) for moving said carriage (20) includes a first  
10 motor (30) which is affixed to said frame (25) and  
drives an elongated screw (22) threadably engaging  
said carriage (20), and wherein said means (26,32) for  
rotating said lever (34) includes a second motor (32)  
which is affixed to said frame (25) and drives an  
15 elongated bar (26) engaging said lever (34).

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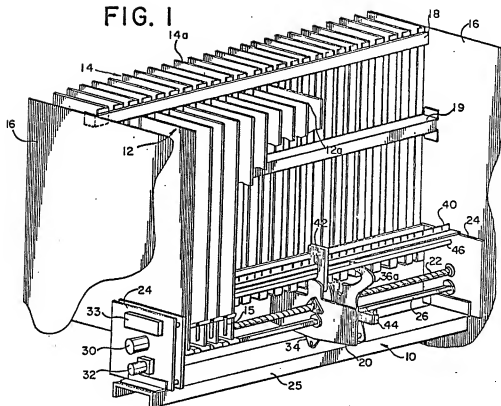
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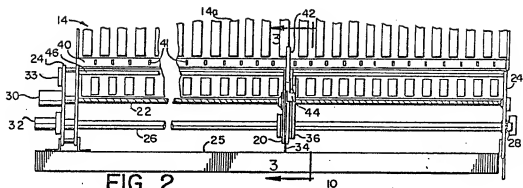
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FIG. 1



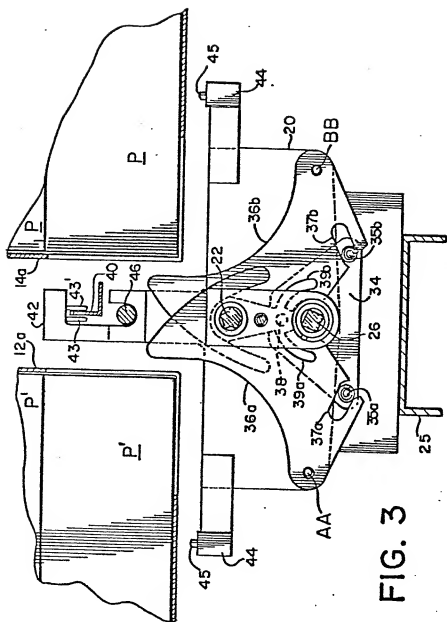
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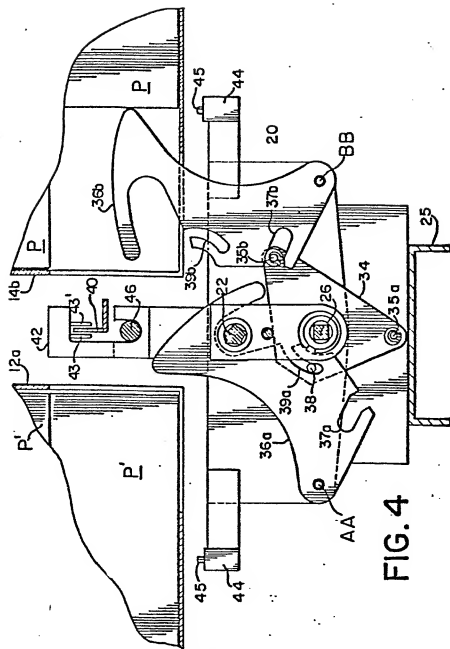
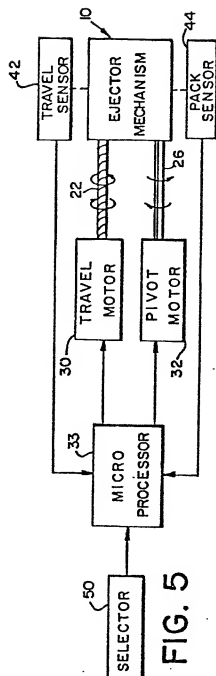


FIG. 4

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European Patent  
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# EUROPEAN SEARCH REPORT

0048479

Application number  
EP 81 10 7472

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>GB - A - 872 244</u> (M. VERDIER)</p> <p>* Page 1, line 8 - page 2, line 62; page 2, line 114 - page 3, line 31; figures 1-3 *</p>	1-4, 6, 9	G 07 F 11/24 11/08
	<p><u>DE - A - 650 841</u> (S. GEERKEN)</p> <p>* Page 1, line 57 - page 2, line 19; figures 1-3 *</p>	1, 2, 6, 8, 9, 11	
	<p><u>US - A - 3 265 176</u> (D.W. ADEN)</p> <p>* Column 3, line 10 - column 9, line 7; figures 1-9; 21 *</p>	1-4, 6-11	TECHNICAL FIELDS SEARCHED (Int. Cl.)
	<p><u>US - A - 3 692 211</u> (C.H. FLUBACKER)</p> <p>* Column 2, line 53 - column 6, line 68; figures 1-6 *</p>	1-11	G 07 F 11/00 11/02 11/04 11/08 11/10 11/16 11/24 11/28 11/30 11/32 11/42 11/62 11/64 B 65 G 1/04 1/08
	<p><u>GB - A - 1 090 475</u> (FISHLOW PRODUCTS LTD)</p> <p>* Page 3, line 89 - page 4, line 85; figures 1, 2, 7, 8 *</p>	1, 4, 6, 9	CATEGORY OF CITED DOCUMENTS
	<p><u>US - A - 3 924 779</u> (J.C. LINDSEY)</p> <p>* Column 6, line 21 - column 8, line 28; figures 2-10 *</p>	1, 6, 9	X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
	<p><u>US - A - 3 432 074</u> (A.M. BROWN)</p> <p>* Column 1, line 58 - column 2, line 9; figures 2, 3, 4, 5 *</p>	1, 9	A: member of the same patent family, corresponding document
	<p><u>GB - A - 841 737</u> (FISHER &amp; LUDLOW)</p> <p>* Page 1, lines 56-69; page 3, lines 25-34; figures 1-5 *</p>	1, 9	
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	21-12-1981	RUDOLPH	



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## EUROPEAN SEARCH REPORT

0048479

Application number

EP 81 10 7472

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